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On the Tasmanian Syncarida

By

George E. Nicholls
(Department of Biology, University of Western Australia.)

Since great zoological interest normally attaches to extant members of very ancient groups of animals, it is a matter for some surprise that more attention has not been devoted to one such order—the Syncarida.

It is an order of very great antiquity which (1) is known to have been widely distributed in Palaeozoic time, but is to-day practically extinct: of the four known existing species, three are Tasmanian (*Anaspides tasmaniae* Thomson, *Paranaspides lacustris* Smith, and *Micraspides calmani* Nicholls), while the fourth (*Koonunga cursor* Sayce) is recorded only from Victoria and is apparently nearing extinction.

Since knowledge derived from fossil species must necessarily be fragmentary and inexact, these few persisting species afford the sole material which can give an understanding of many points; but of the living forms, even, our knowledge is still by no means complete. A puzzling feature of the accepted classification of the Malacostraca is the apparent isolation of the Syncarida within the class, and, in the opinion of the writer, clues to the affinities of the Syncarida to other orders may yet be brought to light by a more detailed study of these few surviving members. Possibly, too, species as yet unknown may still be awaiting discovery.

Accordingly, this note has been written in the hope that it may stimulate local interest in these Tasmanian ' living fossils ' and so lead, at least, to the accumulation of more complete information on the distribution of known forms, as well as on the breeding season of *Paranaspides* and *Micraspides* and perhaps to the securing of their eggs and developmental stages.

Historical Summary

While it is true, as stated above, that the group as a whole has received comparatively little attention, one species, *Anaspides tasmaniae*, has been studied in considerable detail, this for several reasons. The chief, probably, is that *Anaspides* has been accepted as the most primitive (ancient) living member of the group—a point of view which will be discussed later. Also, it was the first to be discovered, in 1892. It is the largest species (reaching a length of nearly two inches), and although, at first, it was supposed to be confined to Mt. Wellington, actually it is widespread in Tasmania, specimens being comparatively easily obtained.

Unfortunately, the descriptions given by Thomson (1893, 1894) were inaccurate in several important particulars: that author failed, moreover, to appreciate the great zoological significance of his discovery and assigned *Anaspides* to a marine group, the Mysids.

(1) Excluding the Bathynellacea.

Two years later Calman (1896) partly re-described it, correcting some of Thomson's mis-statements, and pointed out its kinship with fossils already recorded from the Carboniferous strata of the Northern Hemisphere.

Subsequently Woodward (1908) gave an account of another of these fossil forms (from the Coal Measures of Derbyshire) which, impressed by its striking likeness to *Anaspides*, he named *Prænaspides præcursor*. This name was abandoned some years later when Calman transferred it to a genus earlier established for a North American fossil, *Palæocaris typus* Meek & Worthen; it became therefore *Palæocaris præcursor*.

In the opinion of the writer it was regrettable that the name *Prænaspides* was discarded, for not only were the two fossils found in widely separate localities but (if the published figures may be relied upon) they seem to have differed in so many details as fully to justify the use of distinctive generic names (1).

In any case the point to be stressed here is that as far back in time as the Carboniferous Period, there lived in England an animal which apparently differed very little from this survivor into our own time. Dr. Manton goes further, stating (1930, p. 800): "*Anaspides* has apparently lived *on Tasmanian mountains* undergoing little change since Carboniferous times". (My italics.)

Since 1896 when Calman redescribed *Anaspides* there have been made several other important contributions to our knowledge of that animal. G. M. Smith (1909 b) gave an excellent figure in natural colours of the living animal and added many details concerning its morphology.

Apart from this, Smith's visit to Tasmania resulted in the discovery of a second, rather smaller, living Tasmanian form which he named *Paranaspides lacustris*, the specific name given to stress the fact that this species was restricted to lacustrine waters. Actually, it is known only from the Great Lake. It differs markedly from *Anaspides*, for this latter has an elongate flattened body and frequently a creeping or running habit; *Paranaspides*, on the contrary, is purely a swimming form of typically prawn-like appearance.

Influenced probably by his knowledge of the antiquity of *P. præcursor* and of its close likeness to *Anaspides*, Smith jumped to the conclusion that the ancestor of all the higher Crustacea was probably straight-bodied and ambulatory (i.e., like *Anaspides*) and from this he proceeded to the further conclusion that *Paranaspides* was "probably the most aberrant of all the Syncarida . . . . this (prawn-like) habit and the characters correlated with it (being) . . . . most probably a fairly recent acquisition" (1909 b, pp. 497-498).

The possibility that it was the Anaspidan form which might really be the more specialised, resulting from adaptation to the creeping or walking habit in place of a still earlier swimming mode of life, seems not to have occurred to Smith, nor indeed to any subsequent writer on the Syncarida (2).

Yet, with the possible exception of the Syncarida, the most primitive living Eumalacostraca are, in all probability, represented by Mysidacean forms such as *Gnathophausia*. A comparison of *Paranaspides* with *Gnathophausia* (and other Lophogastrids) has suggested to the writer that, contrary to Smith's view, certain features displayed by *Paranaspides*, so far from being 'aberrant' or secondary, may well be considered as primitive, the survival of a stage still more ancient than that represented by *Anaspides*.

In order to present this view fairly it has been found necessary largely to redescribe the Great Lake Shrimp, certain quite important features (which acquire

(1) It is practically certain that if the two living forms *Koonunga cursor* and *Micraspides calmani* had been known only from fossils, they would have been united in a single genus. The remains of *P. typus* differ much more evidently from *P. præcursor* than do the two living forms from one another.

(2) There is a hint of such possibility in the penultimate paragraph of a paper by Dr. Manton (1930, pp. 799-800).

peculiar significance in the comparison with *Gnathophausia*) having been overlooked by Smith. That, however, is far too lengthy a story to enter upon here.

Since the publication of Smith's papers (1908, 1909 b), the morphology of the mouth parts and their mode of functioning has engaged the attention of Cannon & Manton (1929), some of the conclusions upon the latter having, in a more recent paper by Manton (1930), been modified somewhat after a study of living material. This last-mentioned paper deals with the habits, &c., of the two then known Tasmanian Syncarida and is delightfully illustrated by plates showing these species in natural colouring.

About two years earlier the writer had had the good fortune to discover yet a third (quite the smallest) living Tasmanian member of this group. This *(Micraspides calmani)* was less than half the length of *Paranaspides*, had the general shape of *Anaspides*, but in some ways seemed intermediate between them. It lives only under moss in gently trickling water or in waterlogged soil and apparently is restricted to the lower slopes of certain mountains in Western Tasmania.

It was named and described (1931), the account dealing with external features only. Nothing of its development is known, which also is the case with *Paranaspides*, but that of *Anaspides* has been very thoroughly followed by Hickman (1937).

It may perhaps be worth recording that, in 1929, two specimens of *Anaspides* were successfully transported, by the writer, alive from Hobart to London and were exhibited there at a meeting of the Zoological Society, a photograph of one of the specimens appearing in the Natural History Magazine.

Distribution, Habitat and Habits of Tasmanian Syncarida

1. Anaspides tasmaniae

As Manton (1930) has noted, two colour varieties may be found—one a very dark brown (appearing almost black) form taken from pools on the upper levels of Mt. Wellington, and the other much lighter in colour (yellowish-brown), said to match its background in sandy or pebbly pools in creeks on the slopes of Mt. Wellington.

In the writer's experience, the dark coloration prevails almost everywhere the species is taken (many quite remote from Mt. Wellington) and the conclusion seems inevitable that this is the original colour of the species, departed from only where individuals have developed in unusual situations.

List of Localities from which the species has been recorded:

(Note: Square brackets contain the writer's comments.)

1. Summit of Mt. Wellington—Thomson's original record (1893).
2. Lake Field [? tarns on Mt. Field]—Thomson, fide Calman (1896).
3. Mt. Wellington, isolated pools and pools of upper part of North West Bay River—Smith (1908).
4. Hartz Mountains, tarns near summit—Smith (1908).
5. Mt. Read, West Coast, tarns—Smith (1908).
6. Mt. Field, tarns and streams near summit—Smith (1908).
7. Lake St. Clair [? creeks entering]—Powell (1946).

Specimens in the collection of the Queen Victoria Museum, Launceston, are recorded from the following localities:

8. Cradle Mt. district.
9. Great Lake, creek near Brandons.
10. Great Lake, streams running into northern end.

FIG. 1.—Map to show localities in which *Anaspides* has been found in Tasmania. The numbers refer to the following data (see text)—(*a*) 1-7, previous records; (*b*) 8-13, specimens in collections of Queen Victoria Museum; (*c*) 14-26, specimens in collections of Tasmanian Museum; and (*d*) 27-31, additional records.

11. Great Lake, Reynolds Neck.
12. Ironstone Mountain.
13. Walls of Jerusalem, Jones Tarn, foot of Western Wall.

Specimens in the collection of the Tasmanian Museum, Hobart, are recorded from the following localities:

14. Great Lake, creek near northern end.
15. Great Lake, mouth of creek near Reynolds Neck.
16. Great Lake [? creek entering], one mile north of Rainbow Chalet.
17. Lake Denison [? lake, Denison Range], 1900 ft.
18. Lake Fenton.
19. Shannon Lagoon [probably pool or creek near].
20. Lake St. Clair [? creeks entering].
21. Mt. Bowes.
22. Lake Pedder.
23. Weld River.
24. Snowy Mts., 2000 ft.
25. Snowy Mts., at Skinners Lake, 3000 ft.
26. Snowy Mts., 3000 ft.

In addition to these localities, the writer has found *Anaspides* in several creeks around the Great Lake: as well as records for three creeks at the Northern End there are others for creeks entering the Lake along both Western and *Eastern* (27) shores. It occurs abundantly, too, in trickles and creeks discharging into Pine Lake (28) as well as in the Lake itself. Water holes at " Stone Hut " (29) some miles from Miena along the " Missing Link " yielded large specimens; a water hole some miles S.E. of Miena (30) also yielded examples. Finally, they were found very abundantly in the swiftly flowing waters of creeks which are apparently the headwaters of the Liffey (31).

In several cases, the locality data lack the precision which is desirable. One cannot but wonder, for instance, whether " Lake St. Clair " does mean the Lake itself or simply small rivulets flowing into it. The writer (who, however, cannot claim any authority on this point) has failed to take, or observe, any specimens in the Lake, but these are said on good authority to exist in the smaller and higher L. Hugel, although this is not supported by evidence of actual specimens. In this connection, too, it is interesting that Prof. Baldwin Spencer who took Phreatoicids in the nearby L. Petrarch did not record *Anaspides* from that Lake.

Similarly, from the Great Lake, no specimen has ever been collected, or at least recorded, and the writer's collecting experience in this area goes to show that specimens are *not* found, even in briskly flowing creeks, near the point of actual discharge into the Lake; they seem to be absent below a minimum height of about 50 feet above the lake level. Nor has a specimen ever been vouched for as found in the stomach of trout taken in the Lake.

It will be interesting to determine whether *Anaspides* is in fact confined to swiftly flowing water. It almost certainly does not occur in the Great Lake; and doubtfully in Lake St. Clair. It is unlikely that the presence of trout is a limiting factor, for the writer has caught small trout and *Anaspides* simultaneously in a single sweep of the net, and they may frequently be seen together in the same tiny pools. Nor is it likely that altitude can affect its distribution, for *Anaspides* is found upon Mt. Wellington, for example, from the summit (4000 odd feet) down to about 1000 feet (in the Lenah Valley).

It may be expected that many more localities will he added but it is worthy of note that all localities, at present known, lie in the highlands of the central, western and southern areas of Tasmania; *Anaspides* seems to be absent from the northern and eastern parts. Although very many of the localities lie in the Derwent River system, there are a number of records for waters outside this system and it can only be concluded that the present limited area for which records are established is merely due to the fact that there has been more collecting in areas drained by the Derwent. Generally speaking these areas are much easier of access than the western and southern areas of Tasmania. It is therefore obvious that much has yet to be learnt about the distribution of *Anaspides*.

2. Paranaspides laeustris

This is found only living amongst weed growing on the floor of the Great Lake and, apparently in rather different surroundings, in the overflow which constitutes the Shannon Lagoon. In the Great Lake it occurs at depths of 12 feet and over, presumably occurring wherever the common *Chara sp.* is established. The considerable changes of level consequent in the damming of the Great Lake at its southern end, with the flooding of various adjoining swampy areas, and later the turning into the Lake of the water of the River Ouse, have all contributed to the modification of very long standing conditions—the most important being the possible drowning of *Chara* in the deeper parts, and its slow re-establishment in shallower areas.

The introduction of trout, too, may have had an indirect effect upon the shrimp, although they seem to prey upon it to a negligible extent (Evans, 1942).

Whatever the reason, this priceless relic was near to extinction in the later twenties; indeed Tillyard (1933) declared that it had vanished. In 1929, Dr. Manton was able to secure only two specimens, but at the present time examples (not fully grown) are obtained without much difficulty. In the summers of 1945/46 and 1946/47 the writer has obtained numerous specimens and Plomley (1946) has also reported collecting them. In the writer's view, a fully grown female has doubtfully been seen, nor to date have the eggs or young stages been secured. It is to be hoped that the raising of the lake some 6-8 feet during 1946 will not cause another decline in their numbers through destruction of their feeding grounds.

3. Micraspides calmani

1. First taken by the writer early in 1927, under sphagnum in trickling water, on the lower northern slopes of Mt. Lyell. In the following year this locality yielded very few specimens, but the species was found in relative abundance

2. in diatom-laden ooze in which a giant moss *(Polytrichum)* was rooted, in a trickle on the northern side of the Lyell Highway (then under construction) at a point about thirteen miles from Queenstown, and

3. in waterlogged soil in almost stagnant water on the southern or south-western slopes of Mt. Heemskirk.

Trips made subsequently to these localities failed to furnish additional specimens—nor do other collectors appear to have taken examples. In February, 1945, however, a few specimens were secured from a small sphagnum-covered soak by the side of the new road from Queenstown to Strahan and Zeehan, only a few hundred yards distant from the first locality.

This small, blind Syncarid is in life almost transparent—only the more mature specimens show a brown marbling on the upper surface of the body while in the abdomen the coloration is intensified by the golden tint of the gonad which is seen through the translucent integument.

In clear water it swims freely, although there is little doubt that it can inhabit soil interstices, in which case it almost certainly moves by running or creeping.

Where it swims it does so with a swift gliding movement and, curiously, in bright light its shadow may be seen although its transparent body escapes observation. Usually it occurs with numerous other blind crustacea of approximately similar size (5-9 mm.) but its movement is absolutely distinctive.

Feeding Habits

It would appear probable that all three of the Tasmanian Syncarida are filter feeders, a condition which is recorded by Dr. Manton for *Paranaspides*. From a study of preserved material, Cannon and Manton deduced that *Anaspides* also fed in this way.

Subsequently a study by the latter author of *Anaspides*, in life, revealed that this large shrimp, while it may be nourished in part by such method, is largely raptorial. Dr. Manton figures *Anaspides* holding, and feeding upon, quite large tadpoles. Observations made by the writer confirm and extend this, for specimens have been seen to seize (under a dislodged stone) a partly buried earthworm—a prolonged scuffling by the shrimp continued to dislodge particles of mud well after the original turbidity, due to moving the stone, had cleared: finally, the *Anaspides* shot backwards with its prey trailing after it. This could be observed to be clutched principally by the maxillipeds while the hinder peraeopods had been straining and gripping on the mud to maintain its pull.

That *Anaspides* was raptorial has long been known, it being common to find, if several are kept in an aquarium, that any weakly specimens are set upon and devoured by the others.

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NOTE

Several additional records and notes concerning the distribution of *Anaspides* have become available since receiving Professor Nicholls' paper.

Anaspides has been reported from a number of localities in the Cradle Mt.-Lake St. Clair National Park; in tarns and creeks on the Cradle Mt. plateau (approx. 4000 ft.); in pools of a swiftly running small creek on slopes of Mt. Pelion West (approx. 3500 ft.); in Kia Ora Creek (approx. 3000 ft.); in small pools and soaks on Walled Mt., Du Cane Range (approx. 4700 ft.). The party reporting on the above, made the following comments: '*Anaspides* commonest in very small streams and ponds, some of which would apparently dry up in a very dry season. None seen in lakes and very few in larger streams. None seen in country below 3000 ft. They appear most common about 4000 ft. height'.

Other localities are: Cradle Mt., creeks draining into Forth Rv. system; in creek near Mt. Ironstone; in pools on Mt. Anne plateau; in creeks Mt. Mueller (both catchments); in pools below Meander Falls, 2000-2500 ft., Meander Rv.; in running water on eastern slopes of Mt. Ossa, near Perrins Bluff, 3500-4000 ft.

Spargo (*Tasmanian Tramp*, no. 3, (1934), pp. 39-42) gives Ben Lomond as a locality for *Anaspides*. Enquiries have revealed, however, that the statement was not based on actual collections but arose from a rather ambiguous passage by Geoffrey Smith (1909 c, p. 145). The shrimp does not appear to occur in the northern part of Ben Lomond; but there is strong evidence of its occurrence in streams flowing into Lakes Baker and Youl, in the central part of the plateau. A search on Mt. Arthur (approx. 3809 ft., N. Tasmania) was unsuccessful; Mt. Barrow and Ben Nevis have not been investigated.

EDITOR